Poster-1-30

Transport through graphene/CrX_3 van der Waals interfaces

Giulia Tenasini,[1,2] David Soler-Delgado,[1,2] Zhe Wang,[1,3] Enrico Giannini,[1] Ignacio Gutiérrez-Lezama,[1,2] and Alberto F. Morpurgo[1,2]

[1] *Department of Quantum Matter Physics, University of Geneva*
[2] *Department of Applied Physics, University of Geneva*
[3] *MOE Key Laboratory for Nonequilibrium Synthesis and Modulation of Condensed Matter, Xi'an Jiaotong University*

The detailed investigations of electrostatic effects in van der Waals heterostructures (vdW) based on two-dimensional magnets and low-density semimetals, such as graphene, is of key importance for achieving a better understanding and deterministic control of the interface properties. Here, we report the systematic behavior of vdW interfaces based on bilayer graphene (BLG) and a chromium tri-halide CrX_3 (X = Cl, Br, I) where we detect a large charge transfer between graphene and CrX_3, resulting in a bandgap opening in BLG. When gating the system at charge neutrality point we indeed observe a suppression of the conductance of more than four orders of magnitude with an extremely sharp onset as a function of gate voltage in all the investigated CrX_3/BLG interfaces. Thanks to the high quality of our devices, we can quantitatively determine the bandgap in BLG with unprecedented accuracy and explore its dependence on the electric field, confirming the latest theoretical model which includes a more exhaustive analysis of the electrostatic in BLG [1]. Interestingly, we can also determine the bandgap from the threshold voltages of low-temperature transfer curves, which allows us to investigate for the first time the magnetic field dependence of the bandgap in BLG.

[1] S. Slizovskiy, et al., Out-of-Plane Dielectric Susceptibility of Graphene in Twistronic and Bernal Bilayers, Nano Letters 21 (15), 6678-6683 (2021).